

WHAT IS CLAIMED IS:

1. A variable speed clutch comprising:
  - a source coupler;
  - a first input drive coupled to the source coupler and configured to rotate;
  - a second input drive configured to rotate;
  - an output shaft configured to rotate;
  - a first input hub coupled to the first input drive and configured to rotate about the output shaft in a first direction;
  - a second input hub coupled to the second input drive and configured to rotate about the output shaft in a second direction opposite the first direction;
  - an output hub fixed to the output shaft and configured to rotate therewith;
  - a wrap spring having a first and a second end, the first end of the wrap spring fixed to the output hub such that the first end of the wrap spring rotates with rotation of the output hub;
  - a control hub coupled to the second end of the wrap spring; and
  - a control motor coupled to the control hub, the motor configured to alternatively rotate the control hub, wherein rotation of the control hub in the second direction causes the wrap spring to wrap open thereby engaging the second input hub and wherein rotation of the control hub in the first direction causes the wrap spring to wrap down thereby engaging the first input hub.
2. The variable speed clutch of claim 1 wherein the speed of rotation of the control hub in the second direction is variably controlled by the control motor such that the speed of rotation of the output shaft varies from stationary up to the speed of rotation of the second input driver and wherein the speed of rotation of the control hub in the first direction is variably controlled by the control motor such that the speed of rotation of the output shaft varies from stationary up to the speed of rotation of the first input driver.
3. The variable speed clutch of claim 1 further including a housing enclosing at least the first and second input hubs and the wrap spring, the

housing filled with oil such that heat generated by the engagement between the wrap spring and the first and second input hubs is dissipated in the oil.

4. The variable speed clutch of claim 1 wherein the wrap spring is in an equilibrium state when the control motor is stationary such that there is no engagement between the wrap spring and either the first or second hub and such that the output shaft may rotate free from interference from the first and second input drives.

5. The variable speed clutch of claim 1 wherein the control motor is a DC motor.

6. The variable speed clutch of claim 1 wherein an input drive source is coupled to the source coupler, wherein the first input drive is coupled to the second input drive, wherein the first input drive includes a first worm gear configured to drive the first input hub in the first direction and wherein the second input drive includes a second worm gear configured to drive the second hub in the second direction.

7. The variable speed clutch of claim 1 configured within a vacuum cleaner having wheels and a vacuum motor, wherein the source coupler is coupled to the vacuum motor and wherein the output shaft is coupled to the wheels such that speed of rotation of the wheels is variably controlled by the variable speed clutch.

8. The variable speed clutch of claim 7 configured such that the vacuum cleaner wheels are free when the control motor is stationary such that the vacuum cleaner may be freely moved by a user on its wheels, and configured such that the vacuum cleaner wheels are rotated by the vacuum motor when the control motor is rotating such that the vacuum cleaner is moved by its own power.

9. The variable speed clutch of claim 1 configured within a lawnmower having wheels and a lawnmower engine, wherein the source coupler is coupled to the lawnmower engine and wherein the output shaft is coupled to the wheels such that speed of rotation of the wheels is variably controlled by the variable speed clutch.
10. The variable speed clutch of claim 1 wherein the second input hub is an outer cylindrical hub configured to surround the wrap spring and wherein the first input hub is an inner cylindrical hub configured within the wrap spring.
11. The variable speed clutch of claim 1 wherein the first input hub is an outer cylindrical hub configured to surround the wrap spring and wherein the second input hub is an inner cylindrical hub configured within the wrap spring.
12. A variable speed clutch comprising:  
an output shaft having an axis of rotation;  
a first input hub coupled to an input rotation source and thereby configured to rotate in a first direction about the output shaft;  
a second input hub coupled to the input rotation source and thereby configured to rotate in a second direction, opposite the first direction, about the output shaft;  
an output hub fixed to the output shaft and configured to rotate therewith;  
a wrap spring having a first and a second end, the first end of the wrap spring fixed to the output hub such that the first end of the wrap spring rotates with rotation of the output hub;  
a control hub coupled to the second end of the wrap spring and configured to alternatively rotate, such that rotation of the control hub in the second direction causes the wrap spring to wrap open thereby engaging the second input hub and such that rotation of the control hub in the first direction causes the wrap spring to wrap down thereby engaging the first input hub; and  
wherein the speed of rotation of the control hub in the second direction is variably controllable such that the speed of rotation of the output shaft varies

from stationary to the speed of rotation of the input rotation source and wherein the speed of rotation of the control hub in the first direction is variably controllable such that the speed of rotation of the output shaft varies from stationary to the speed of rotation of the input rotation source.

13. The variable speed clutch of claim 12 wherein the input rotation source comprised a first input drive coupled to the first input hub and a second input drive coupled to the second input hub, wherein the first input drive causes the first input hub to rotate in the first direction about the output shaft and wherein the second input drive causes the second input hub to rotate in the second direction about the output shaft.

14. The variable speed clutch of claim 12 wherein the control hub engages a variable speed control motor and wherein the speed and direction of rotation of the control hub is controlled by the variable speed control motor.

15. The variable speed clutch of claim 12 further including a housing enclosing at least the first and second input hubs and the wrap spring, the housing filled with oil such that heat generated by the engagement between the wrap spring and the first and second input hubs is dissipated in the oil.

16. The variable speed clutch of claim 14 wherein the wrap spring is in an equilibrium state when the control motor is stationary such that there is no engagement between the wrap spring and either the first or second hub in the equilibrium state such that the output shaft may rotate free from interference from the first and second input drives.

17. The variable speed clutch of claim 14 configured such that the variable speed clutch is mounted within a vacuum cleaner having a vacuum motor and wheels, wherein a drive shaft rotated by the vacuum cleaner motor is coupled to the first and second input drives and wherein the output shaft is coupled to the wheels of the vacuum cleaner such that by variably controlling the speed of the

variable speed control motor, the vacuum cleaner is moved on its wheels at variable speeds.

18. The variable speed clutch of claim 13 wherein the input rotation the first and second input drives are generally parallel to each other and wherein first and second input drives are generally perpendicular to the output shaft.

19. A variable speed clutch comprising:  
an output shaft having an axis of rotation;  
a first input hub coupled to a first input rotation source and thereby configured to rotate in a first direction about the output shaft;  
a second input hub coupled to a second input rotation source and thereby configured to rotate in a second direction, opposite the first direction, about the output shaft;  
an output hub fixed to the output shaft and configured to rotate therewith;  
a wrap spring having a first and a second end, the first end of the wrap spring fixed to the output hub such that the first end of the wrap spring rotates with rotation of the output hub; and  
means coupled to the second end of the wrap spring for alternatively causing the wrap spring to wrap open a variable amount thereby engaging the second input hub by a variable amount and for causing the wrap spring to wrap down a variable amount thereby engaging the first input hub by a variable amount.

20. The variable speed clutch of claim 19 wherein the first and second input rotation sources are first and second input drives that are generally parallel to each other and that are generally perpendicular to the output shaft.

21. The variable speed clutch of claim 19 wherein the first input hub is an outer cylindrical hub configured to surround the wrap spring and wherein the first input hub is an inner cylindrical hub configured within the wrap spring.